ET-51 May 1935

METHODS AND APPARATUS DEVELOPED FOR STUDYING DISPERSION OF NITIDULIDS

By Dwight F. Barnes, Division of Fruit Insects,
Bureau of Entomology and Plant Quarantine,
U. S. Department of Agriculture

A study of the dispersion of the dried fruit beetle, Carpophilus hemipterus L., undertaken at the Bureau's dried fruit insect laboratory at Fresno, Calif., in 1934, required the collection, marking, and liberation of a large number of adults and the recapturing of some of the same individuals. In order to handle this small, active insect it became necessary to modify old pieces of apparatus and devise new ones, as follows:

1. After removing the beetles from decaying oranges in the chloropicrin separator, they were separated from the fine debris which fell from the apparatus along with the beetles by placing them in a tight box provided with a glass escape vial. A useful means of attaching the vial to the box consisted in passing it through a rubber gasket. The gasket attachment was made by boring a hole, somewhat larger than the vial, in the front of the box and in two cleats made from 1/4-inch stock; and a hole slightly smaller than the vial was cut in a piece of automobile inner tube. The rubber was placed between the cleats, which were then nailed to the box so that all openings were in line. This arrangement held the escape vial firmly in place, made an insect-tight joint, and permitted easy replacement of the vials.

2. The number of insects was estimated by transferring them from the escape vial to a 5-cc. graduate, measuring the volume, and computing the number. A plunger of constant weight (in this case 27 grams), which fitted the inside of the graduate closely, was used to secure uniformity in measuring the volume. The plunger was allowed to sink slowly on the insects in the graduate until it came to rest, and the reading was taken immediately. If the reading was delayed the active beetles began to raise the plunger. The best results were secured by measuring 2 cc. to 3 cc. of insects, about 600 to 900 individuals, at one time. The use of a weighted plunger gave more reliable estimates than jarring the graduate before recording the volume.

3. Prior to being stained, the measured beetles were accumulated in screen-top Kerr type mason jars, and since the jars were opened frequently before their quotas were made up, some beetles escaped. A trap door cover (figure 1), used while filling the jars, effectively stopped these losses. It was made from a piece of sheet iron cut the same size as the disc cover of the Kerr top and backed with a piece of dressed pine about 3/8 of an inch less in diameter than the metal disc. A 1¼-inch round hole was cut through the metal and wood and closed from the inside by a spring trap door, made by soldering a 1½-inch disc of sheet iron to a spring-type cupboard hinge, after

the original spring had been replaced by a weaker one. To make the closure tight a wooden wedge was placed between the hinge and disc. The hinge, wedge, and disc were fastened together with liquid solder. This cover was a modification of a transfer device used at the Bureau's forest insect laboratory at Melrose Highlands, Mass., for transferring parasites from rearing trays to colonization tubes.

In operation the trap door cover replaces the disc of the Kerr top, the threaded rim being used to hold it in place. The vial containing the counted insects is inverted and used to open the trap door, after which a sharp rap on the bottom of the vial empties it. The spring on the hinge should not be of sufficient strength to delay opening the door until the insects fall from the vial, but should be sufficiently strong to close the door promptly and prevent escape. This top is very useful for collecting and handling other active insects.

4. For staining, the beetles were placed in a cage made by building a cylinder of 24-mesh wire cloth on the thread of a mailing tube 3½ inches in diameter. The original cover of the mailing tube, perforated with a ½-inch hole closed with a cork, was used to close the cylinder. The spray was applied by means of a hand atomizer inserted through the hole in the cover. After spraying, the cage was placed in the breeze of a small electric fan until the beetles were dry and crawling freely.

5. Carrying the marked beetles to the field in screen-top glass jars was unsatisfactory; the beetles left the jars slowly, and efforts to hurry them resulted in their dropping to the ground and dying in the hot dust. A satisfactory method was devised by which 8-pound kraft paper bags were used as containers. The bags were fully opened, the beetles placed in them, the sides at the top folded in so that the front and back were smooth, and the top fastened with two "clothespins". The "clothespin" fasteners were made by rip-sawing an 8½-inch piece of ⅜-inch maple dowel stock for 7 inches of its length. A fastener was placed over the folded bag about 2 inches from the top, the top was folded tightly down over this pin, and a second pin slipped on so that it held the folded-down top as well as the main part of the bag. The pins were long enough so that they extended beyond the bag on both sides and were fastened together with rubber bands. In the field the pins were removed, the opened bags placed in a shady location, and the beetles allowed to escape at will.

Standard dried fruit beetle traps baited with fermenting dried peaches were used to recapture the liberated beetles. All of the beetles taken in the traps were killed, placed on white paper, and sprayed with alcohol and alkaline solutions for dissolving the dried stains.

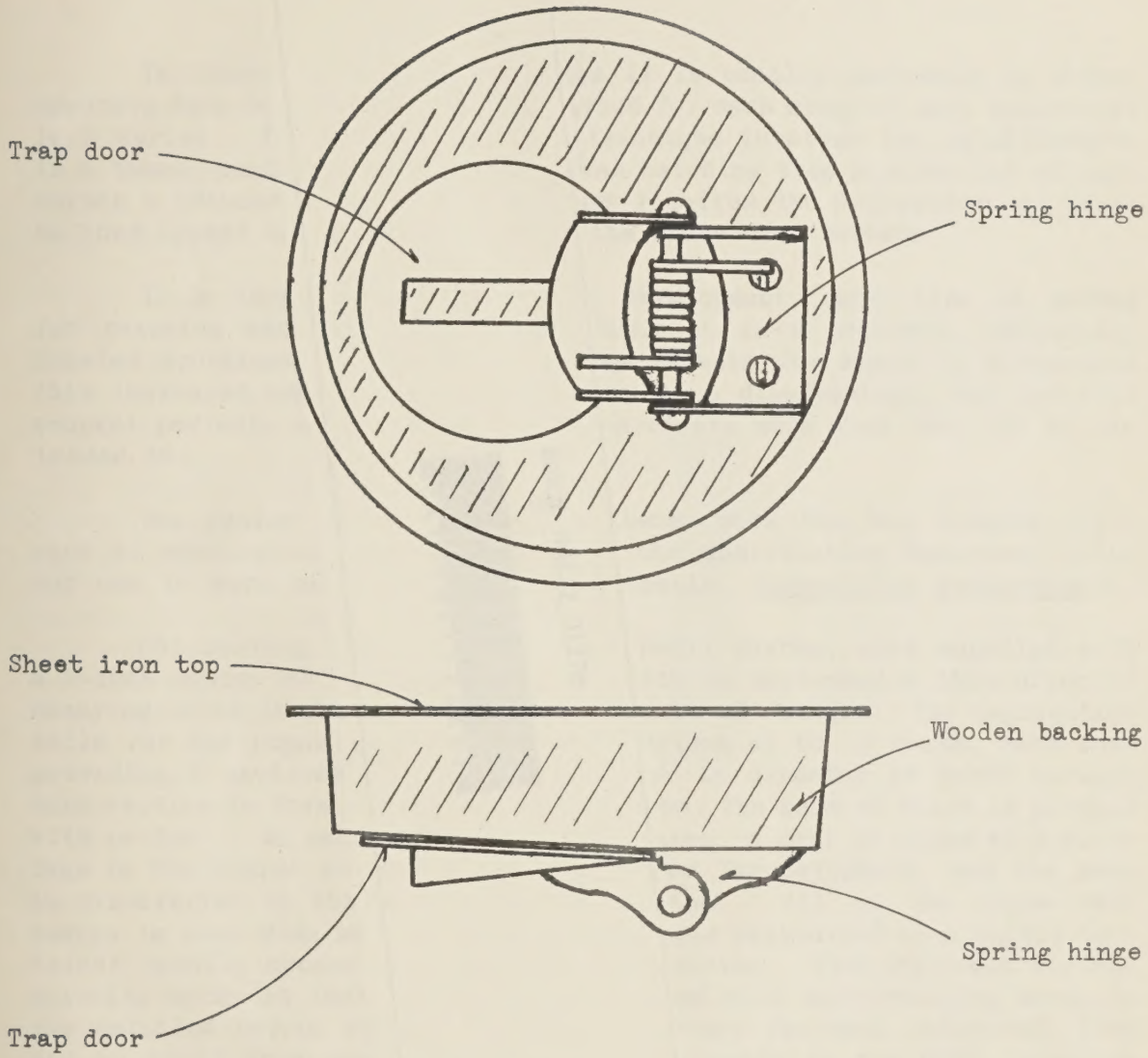

Figure 1. - Trap door cover.